CITY OF WINTERS

CIRCULATION MASTER PLAN

Prepared by:

Wilbur Smith Associates

Adopted
May 19, 1992

WILBUR
SMITH
ASSOCIATES
ENGINEERS • PLANNERS

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May 19, 1992

Ms. Amelia Hutchinson
Public Works Director
City of Winters
318 First Street
Winters, CA 95694

Dear Ms. Hutchinson:

We are pleased to present our *City of Winters Circulation Master Plan* report. This document presents an evaluation of future circulation needs through the Year 2010, based on current land use planning efforts being undertaken for the City's General Plan.

The circulation needs of future growth in Winters to population levels of 12,500 and 14,000 persons were evaluated based on MINUTP traffic modeling software, as well as several variations on these growth scenarios. Our frequent meetings with City staff and the valuable inputs provided by the City of Winters were also essential ingredients in this study effort.

These analyses have led to the development of a recommended circulation plan, as documented in this report. Also included are a recommended roadway classification scheme, recommended street cross-section standards, and a list of roadway improvements which will be needed to support the recommended circulation plan.

We are pleased to have provided our services to the City of Winters, and look forward to doing so in the future.

Very truly yours,

William E. Hurrell, P.E.
Vice President

WEH/GRS:ld
260510

Attachments

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TABULATIONS

ILLUSTRATIONS

I - INTRODUCTION

This Circulation Master Plan for the City of Winters was prepared by Wilbur Smith Associates. It includes an assessment of existing traffic conditions, and, using MINUTP traffic modeling software, an analysis of future traffic conditions for various combinations of land use types and intensities and roadway improvements. It was prepared as part of the process to developed an updated General Plan for Winters. Based on this analysis, a recommended circulation plan was developed including order-of-magnitude cost estimates, along with recommendations for roadway classifications and standards.

Scope of Study

Portions of this report, especially the Existing Conditions section, are based on an earlier study by Wilbur Smith Associates, the Transportation Element of the 1990 *General Plan Options Assessment Study*. Once the implications of the various land use alternatives considered in that effort were shown, a more focused consensus plan was developed, the Draft General Plan (Modified City Council Workplan). Analyses of future conditions undertaken in this report were based on this plan and variations on it.

Report Contents

Following this introductory section Chapter II presents a description of existing traffic, transit and parking conditions in Winters. Chapter III presents a description of the assumptions and methodologies used in estimating future conditions, while Chapter IV describes the results of the analysis of future conditions. Chapter V presents a recommended Circulation Plan and Street Standards.

II - EXISTING CONDITIONS

This chapter presents a description of existing traffic and transportation in Winters based on field surveys and subsequent analysis.

Street Network

Major streets serving the City of Winters include I-505, State Route (SR) 128, Railroad Avenue, Grant Avenue (i.e. SR-128) and Main Street. These streets and the average weekday traffic they carry are shown in Figure 1.

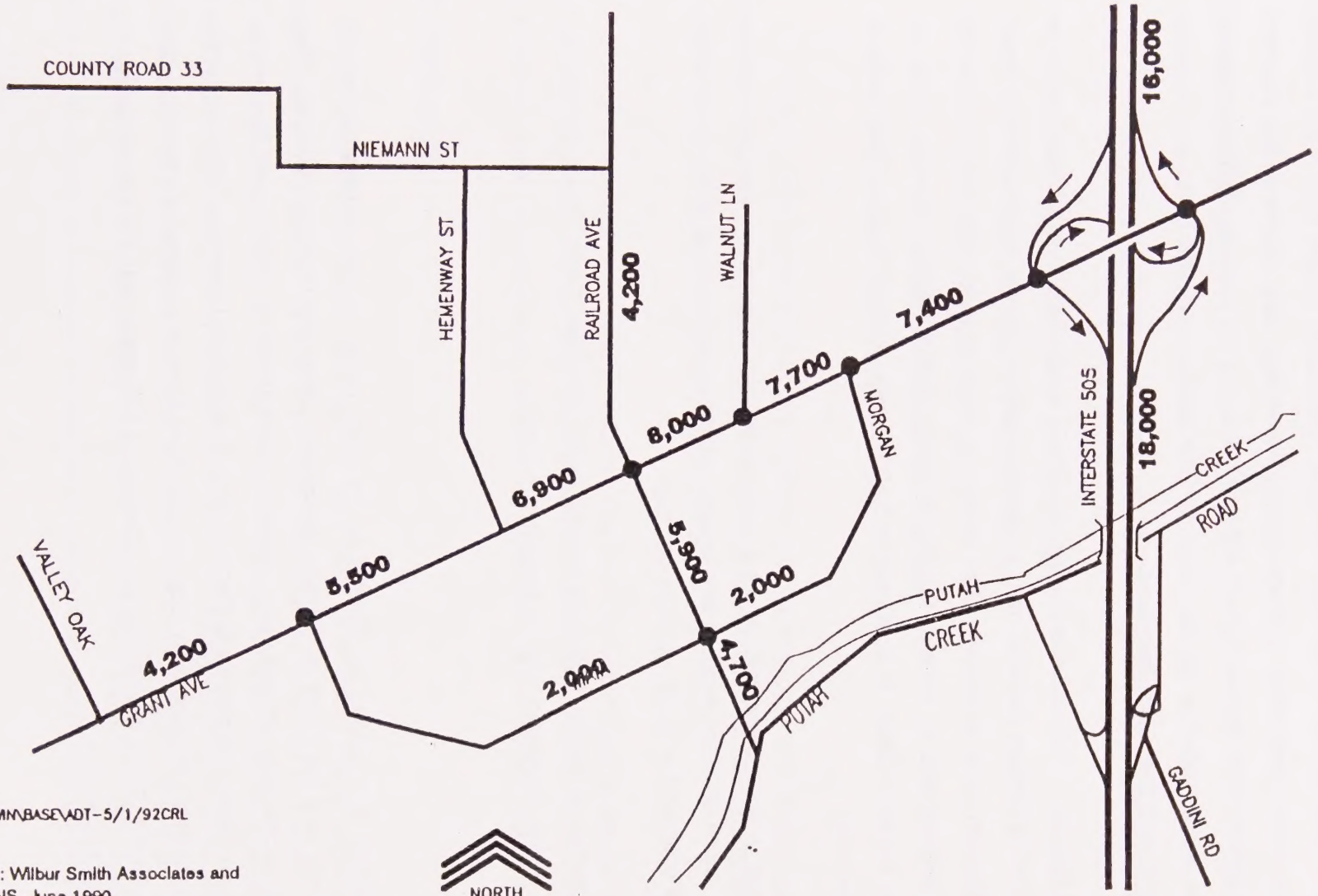
Regional Roadways

I-505 – I-505 is the major regional access route for Winters. The north-south four lane divided highway forms the eastern boundary of the City. I-505 provides a link between I-80 to the south and I-5 to the north. According to 1988 estimates of average daily traffic (ADT), I-505 carried between 16,000 and 18,000 daily trips in the vicinity of the SR-128 junction during the peak month period.

California State Route 128 – SR-128 is an east-west two lane arterial running from I-505 through the City of Winters, where it is named Grant Avenue. SR-128 is connected to the City of Davis on the east and provides access to Napa County and Lake Berryessa to the west. At the intersection of I-505 and SR-128 the 1990 ADT was estimated at 7,400.

Local Roads

The major local street intersection is Grant Avenue (SR-128) and Railroad Avenue (County Road 89), which is controlled by four-way STOP signs. There is a red flashing warning light at this intersection.



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SOURCE: Wilbur Smith Associates and CALTRANS, June 1990.

AVERAGE DAILY TRAFFIC - JUNE 1990

Winters Circulation Master Plan

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Grant Avenue – Grant Avenue serves as Winters' major east-west arterial road. This two lane street provides local commuters with access to I-505 and the City of Davis to the east. As shown in Figure 1, average daily traffic based on June, 1990 counts ranged from 7,400 to 8,000 between Railroad Avenue and I-505. Caltrans reports the average daily volume on this segment to range from 7,200 to 7,800, increasing to 8,400 to 9,100 during the peak month (September or October). Peak month volumes are the result of both locally-generated traffic and regional recreation traffic to and from Lake Berryessa.

Railroad Avenue – Railroad Avenue has one lane in each direction and is designated as an arterial street in the Winters General Plan. It runs from Solano County, south of Putah Creek, to the town of Esparto north of Winters. The street is a major route for traffic from residential areas to Grant Avenue and to Winters Central Business District (CBD). Average traffic on Railroad Avenue, south of Grant, is estimated at 5,900. North of Grant Avenue, daily traffic is 4,200 vehicles per day.

Main Street – Main Street serves as a major east-west collector for the City's oldest residential area, south of Grant Avenue, and is also utilized for commercial traffic in the CBD. Average traffic is estimated at 2,000 vehicles per day.

Other important residential collectors include Valley Oak Drive, Taylor Street, Hemenway Street, Niemann Street, Anderson Avenue and Walnut Lane.

Existing Transit

Transit service is provided to Winters by YoloBus, under a joint powers agreement between the County and the Cities of Winters, Woodland, Davis and West Sacramento. Five round trips are provided daily on weekdays between United Market in Winters and the Amtrak Station in Downtown Davis, with service to Deganawidah Queztalcoatl University (DQU) along the way. This service traverses Winters via a loop, serving Grant Avenue westbound and Abbey and Main Streets eastbound. Three round trips are provided on Saturdays, with the eastern terminus at County Fair Mall in Woodland.

Greyhound Bus Lines and Amador Stage Lines also serve the region. Greyhound includes Winters as a request stop only. Amtrak service to Oakland and Bakersfield is available at Davis.

Existing Traffic Conditions

Existing traffic operations were evaluated at the following unsignalized intersections:

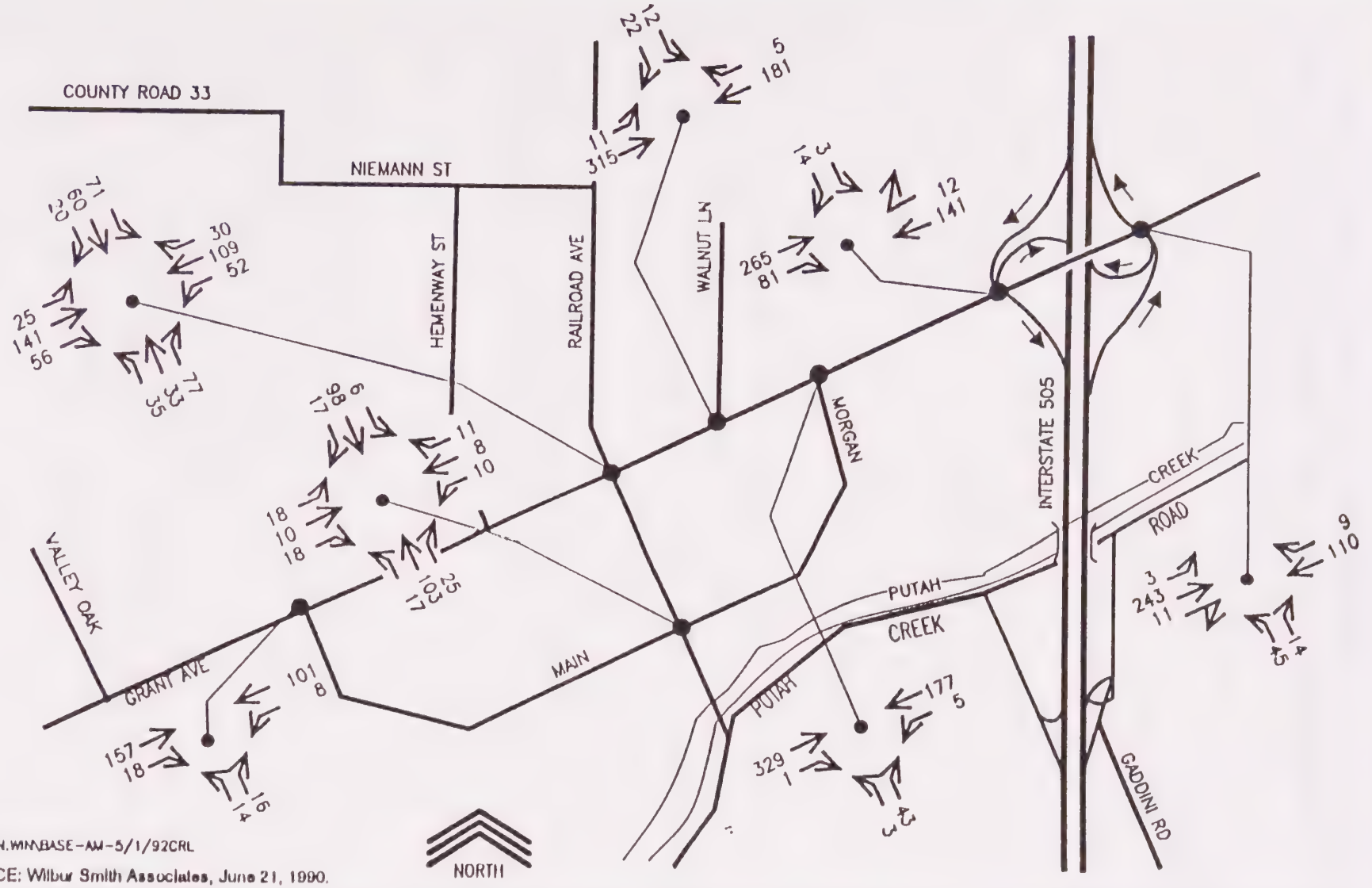
- Grant Avenue/Hwy 505 SB Ramps;
- Grant Avenue/Hwy 505 NB Ramps;
- Grant Avenue/Main Street;
- Grant Avenue/Railroad Avenue; and
- Main Street/Railroad Avenue.

Existing traffic data used in the analysis were obtained by field counts taken by Wilbur Smith Associates on Thursday, June 21, 1990. Figures 2 and 3 illustrate turning movements and traffic volumes for morning and afternoon peak hours, respectively.

Of the five intersections analyzed, two are four-way STOPS and three are T-intersections with STOP signs only on the minor street approach. Because of differences in traffic operations at these two types of intersection, different methods are used to analyze traffic conditions.

"T" Intersections

Level of service (LOS) estimations were used to evaluate traffic conditions at the "T" intersections. The level of service is a single letter evaluation similar to a grade. The levels of service, ranging from LOS "A" to LOS "F", are a method for describing the operating conditions at an intersection , with LOS "A" indicating excellent operating conditions, and LOS "F" very poor conditions. The determination of level of service at "T" intersections is based on the reserve capacity available to a given turning movement. The reserve capacity is the number of vehicles above the observed or expected number which could be accommodated by the turning lane at



EXISTING AM PEAK HOUR VOLUMES

Winters Circulation Master Plan

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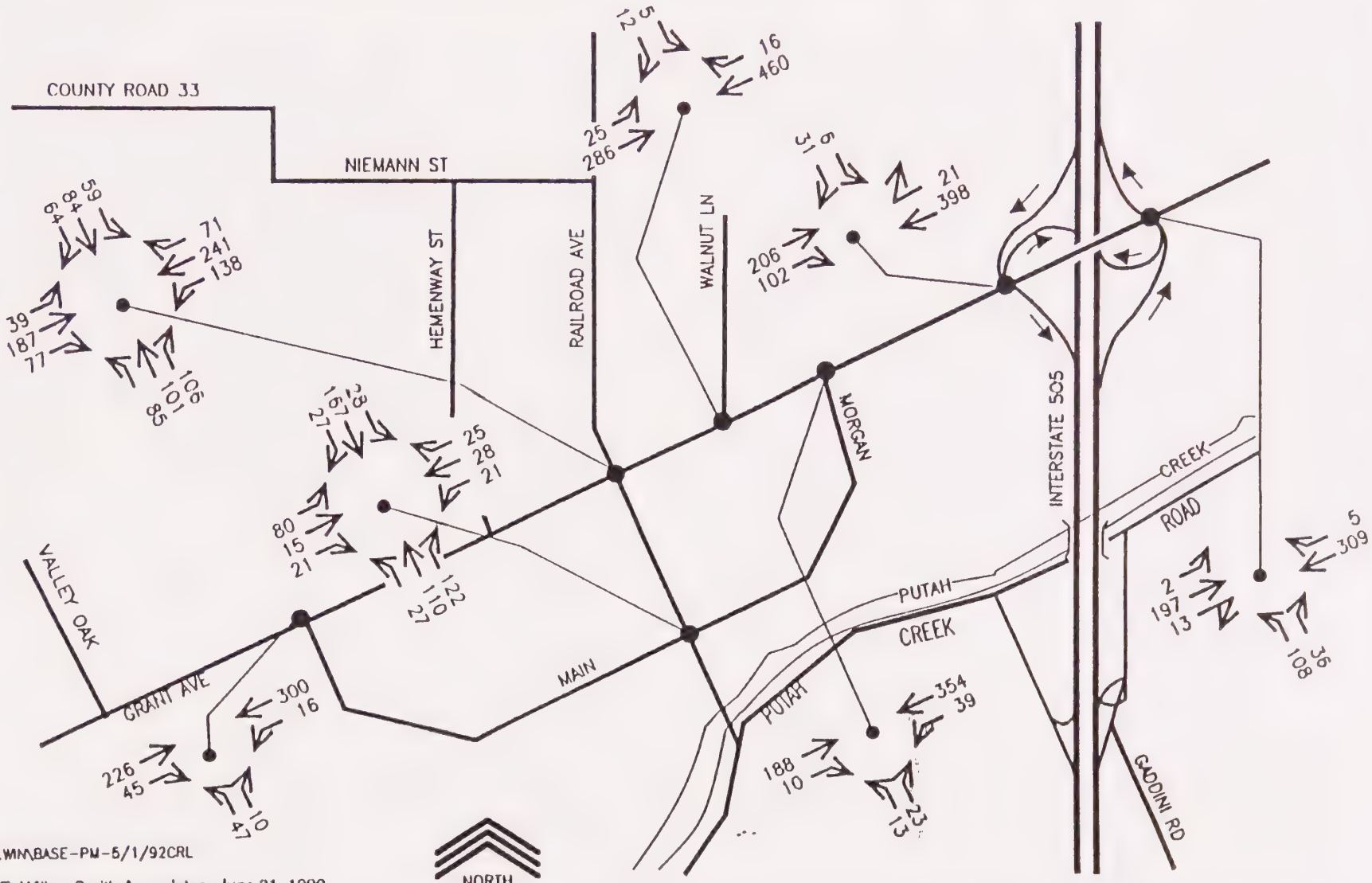

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SOURCE: Wilbur Smith Associates, June 21, 1990.

WSA

EXISTING PM PEAK HOUR VOLUMES

Winters Circulation Master Plan

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the intersection in question. The relationship between level of service, reserve capacity and delay at "T" intersections is shown in Table 1.

Table 1
RELATIONSHIP BETWEEN RESERVE CAPACITY, LEVEL OF SERVICE FOR "T" INTERSECTIONS

Reserve Capacity	Level of Service	Expected Traffic Delay
400 or more	A	Little or no delay
300 - 399	B	Short traffic delays
200 - 299	C	Average traffic delays
100 - 199	D	Long traffic delays
0 - 99	E	Very long traffic delays
Less than 0	E	Failure - extreme congestion
	F	Intersection blocked by external causes

Source: Transportation Research Board, *Highway Capacity Manual*, 1985

Four-Way STOP Intersections

The intersections at Grant Avenue/Railroad Avenue and Main Street/Railroad Avenue are four-way STOP intersections. The techniques used to evaluate level-of-service for these intersections are different than those for other unsignalized and signalized intersections. The *1985 Highway Capacity Manual* provides tables which indicate total volumes for LOS C operation and unacceptable operation under various lane configurations and traffic volume percentages. The method used to evaluate four-way STOP intersections is to calculate the total volume at intersections and the percentage of traffic in each direction, then compare the volume with the appropriate volumes in the tables. Intersection operation can then be characterized as "LOS C or better"; "between LOS C and capacity"; or "over capacity". Existing levels-of-service in both the AM and PM peak hours at the five intersections are provided in Table 2.

Table 2

EXISTING LEVELS OF SERVICE FOR UNSIGNALIZED INTERSECTIONS
Winters Revised General Plan Traffic Analysis

"T" Intersections	Movement	AM Peak Hour		PM Peak Hour	
		RC	LOS	RC	LOS
Grant Avenue/ SB I-505 Ramps	SB Left	453	B	324	A
	SB Right	818	A	568	A
	EB Left	960	A	723	A
Grant Avenue/ NB I-505 Ramps	NB Left	446	A	274	C
	NB Right	723	A	737	A
	WB Left	875	A	918	A
Grant Avenue/ Main Street	NB Left	541	A	304	B
	NB Right	814	A	728	A
	WB Left	936	A	841	A
Four-Way STOP Intersections					
Grant Avenue/Railroad Avenue	Overall	*	CoB	*	C&C
Railroad Avenue/Main Street	Overall	*	CoB	*	C&C

RC = Reserve Capacity
LOS = Level of Service
* = Four-Way STOP: the reserve capacity concept is not applicable.
CoB = LOS C or better.
C&C = Between LOS C and capacity.

Wilbur Smith Associates; July 1990.

As indicated in Table 2, all intersections are operating at LOS C or better during the AM peak period. The intersection at Grant Avenue and Railroad Avenue experiences a significant volume increase during the PM peak period and operates at between LOS C and capacity. Results of each intersection analysis are described below.

Grant Avenue/Southbound I-505 Ramps – this segment of the partial cloverleaf interchange is controlled by a STOP sign on the I-505 southbound off-ramp. The overall operation for these ramps is LOS A during both the AM and PM peak hours.

Grant Avenue/Northbound I-505 Ramps – This segment of the I-505 interchange is controlled by a STOP sign on the northbound off-ramp. The interchange operates at LOS A during the AM peak hour. Overall operation during the PM peak hour is good with northbound left-turns operating at LOS C due to afternoon commute volume increases.

Grant Avenue/Main Street – This "T" intersection is controlled by a STOP sign at the Main Street approach. It operates at LOS A during both the AM and PM peak hours.

Rail Road Street/Main Street – This intersection is controlled by STOP signs at all four approaches. The traffic pattern at this intersection is uneven, with more than 70 percent of the AM and PM peak volume utilizing Railroad Avenue. Intersection operation is well above LOS C during the morning and afternoon peak hours.

Grant Avenue/Railroad Avenue – This intersection is controlled by STOP signs at all four approaches. The level of service analysis indicates a relatively even distribution of traffic during both the morning and afternoon peak hours. The intersection operates at above LOS C during the AM peak hour. The AM peak hour total volume increases by 76 percent during the PM peak hour which results in a level of service of between LOS C and capacity.

Level of Service Summary

Under existing conditions, the three intersections and the I-505 interchange ramps are all operating at or above acceptable levels of service (LOS C), with the exception of the Railroad

Avenue/Grant Avenue intersection during the PM peak hour, which operates at between LOS C and capacity. This intersection meets the Caltrans traffic signal warrant for peak hour volumes during the PM peak hour. It should be noted that the satisfaction of a warrant is not necessarily justification for a signal. Factors such as delay, congestion, confusion or other evidence of operational problems must be shown. The Railroad Avenue/Grant Avenue intersection was observed to be operating in an effective manner during the PM peak period. Westbound traffic on Grant Avenue tended to stack up at the approach but overall vehicle delay was observed to be of short duration. At present this intersection is operating effectively during the PM peak period. Future consideration of a signal may be warranted based on changing demands and overall growth in the area.

Through Traffic

As a State Route, Grant Avenue carries a substantial amount of through traffic at different times of the year. The variation in through traffic is based on the level of activities at Lake Berryessa and other recreation areas to the west of Winters, and on the level of agricultural activity in the areas surrounding Winters on all sides. To assess the level of through traffic on Grant Avenue, a license plate survey was conducted on Thursday, June 21, 1990 during the peak periods of 7:00 AM - 9:00 AM and 4:00 PM - 6:00 PM.

License plates were recorded at two check points located to the west of Valley Oak Drive and to the east of Railroad Avenue on Grant Avenue. License plates recorded at both checkpoints were assumed to be through traveling vehicles. The results of the survey for the peak hours are presented in Table 3.

The license plate survey indicates that during the peak periods 21 to 31 percent of the total traffic on Grant Avenue at Railroad Avenue are through travelling vehicles. The surveys were conducted in June, and many of these through moving vehicles represent recreational trips, to and from Lake Berryessa. Recreational trips are not as peak-oriented as work and shopping trips, therefore, the daily percentage of through traffic on Grant Avenue could be as high as 35 percent. During peak months (September and October), through traffic on Grant Avenue is estimated to be 2,500 - 3,000 vehicles per day.

Table 3
THROUGH TRAFFIC ON GRANT AVENUE
Winters GPA EIR

	AM Peak		PM Peak	
	WB	EB	WB	EB
Total Traffic on Grant Ave.[1] at Railroad Avenue	191	222	450	303
Number of Through-Travelling Vehicles[2]	41	62	120	93
Percentage of Through Traffic	21%	28%	27%	31%

1 Counts taken June 21, 1990.
2 Based on license plate surveys recorded west of Valley Oak Drive/Grant Avenue and east of Railroad Avenue/Grant Avenue.

Wilbur Smith Associates; June 1990.

Existing Parking

In October and November of 1989, the City of Winters conducted a parking survey directed at business owners in the downtown area. The survey results indicated that all of the merchants contacted felt that there was no parking problem in the downtown area.

There are two major public parking facilities located in the Central Business District (CBD). A 60 space dual purpose lot at the Community Center provides parking for the center and for downtown businesses. A joint City and Caltrans park-and-ride lot provides 50 spaces on Railroad Avenue. There is a 4 to 6 space lot across from City Hall which is open to the public. In addition there are 110 on-street parking spaces provided in the downtown area between Railroad Avenue and Second Street on both sides of Main Street. A midday parking occupancy study was conducted on June 21, 1990 in the Winters CBD. Table 4 shows the results of the survey. Hourly vehicle counts were recorded between 10:00 AM and 3:00 PM for all available public parking in the area of Railroad, First and Second Streets along Main Street. Under existing conditions, the downtown parking supply is adequate. There is an average midday utilization rate of about 40 percent with the peak midday demand for parking occurring between noon and 1:00 PM.

Table 4

WINTERS CBD MIDDAY PARKING OCCUPANCY
Winters GPA EIR

	Public Parking Lot[1]		On-Street Parking[2]					
	Community Center Lot	Caltrans Park-and-Ride Lot	Railroad/1st North Block Face	1st/2nd North Block Face	Railroad/1st South Block Face	1st/2nd South Block Face	Total	%*
Total Space Available	60	50	34	20	29	27	220	100%
10 AM	12	14	21	9	17	6	79	36%
11 AM	16	21	24	8	25	10	104	47%
12 PM	18	23	25	10	20	8	106	48%
1 PM	18	13	22	6	16	9	88	30%
2 PM	16	12	22	6	18	8	82	37%
3 PM	14	11	23	16	6	8	78	35%

1 48 hour unmetered parking.
2 2 hour unmetered parking (9:00 AM - 6:00 PM).
* Average occupancy 40 percent.

Source: Wilbur Smith Associates; June 1990.

III - MODELING METHODOLOGY

To project the impacts of future development within Winters on the City's streets, a computerized model of Winters' street system was developed utilizing MINUTP modeling software. Traffic forecasting with MINUTP requires three types of input data:

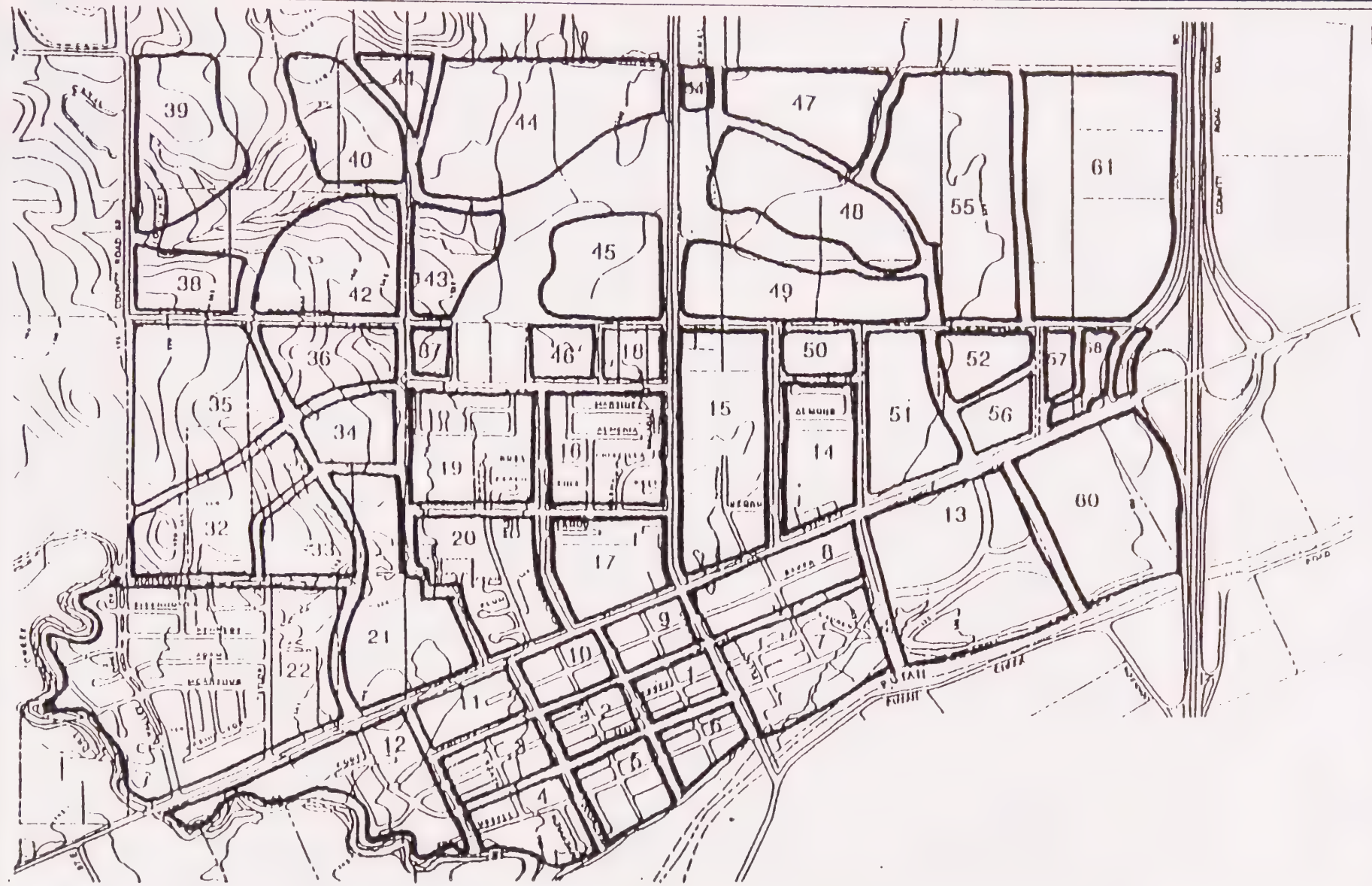
- Street network data (both existing and proposed);
- Quantities and types of land uses; and
- Behavioral data on travelers to, from, and within Winters.

Street network data describes the street system for which traffic will be forecast. The network ties together a system of traffic analysis zones (TAZ's). A TAZ system of 61 zones was used for this analysis. The TAZ boundaries defined for the model are depicted in Figure 4.

Future Highway Network

The basic future highway network assumed in the MINUTP model was provided to WSA by the City of Winters in the form of a base map with an overlay depicting the basic function of key roadways. Minor modifications were made to this street system following discussions with the City. Alternative Putah Creek bridge crossing options were also identified for testing purposes, as discussed below. Figure 5 depicts the basic future network utilized for model runs in this study. Key modifications to this network included:

- New Main Street north road north of Grant Avenue;
- Road 32A Extension from County Road 88 to County Road 90;
- Road 33 Extension from County Road 88 to County Road 90;
- Valley Oak Drive Extension to Road 32A;
- Hemenway St. Extension to Road 32A East of Railroad Ave;
- East Baker Street Extension to Grant Avenue opposite existing Road 90; and
- New connection from Road 33/Industrial Road to Grant Avenue west of the Baker St. terminus.



TRAFFIC ANALYSIS ZONES

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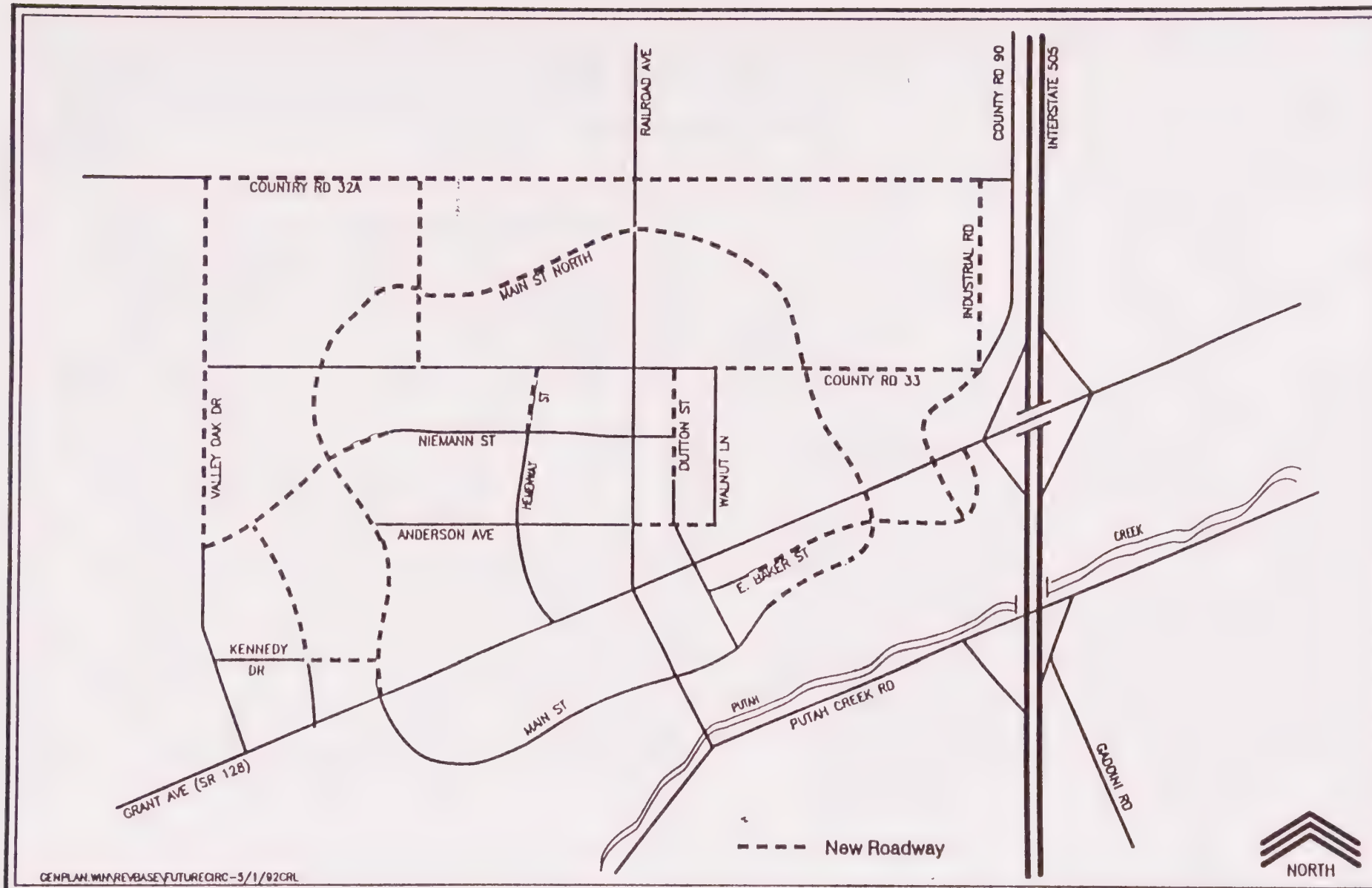

WSA

FUTURE CIRCULATION PLAN

Winters Circulation Master Plan

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A new Johnson Road extension and bridge over Putah Creek were also assumed in some modeling alternatives.

Future Land Use

Future land uses were provided to WSA in the form of base maps and spreadsheets prepared by City staff and the General Plan Consultant, J. Laurence Mintier & Associates. Land uses were provided for a future land use plan featuring a total population of 12,500 persons (the Draft General Plan Alternative), and for a total population of 14,000 persons (the Modified General Plan Alternative). A third alternative, 14,000 population with the additional 1,500 persons shifted north of Niemann Street, was also provided for analysis purposes. All three alternatives featured the same total acreages, with the differing population densities accomplished by reclassifying parcels to higher housing unit densities (from medium density residential to medium high density residential, for example). Projections of commercial land uses were also provided. These were converted to employment using standard employee density factors listed in Table 5.

Table 5
EMPLOYMENT DENSITY AND TRIP GENERATION FACTORS

Land Use Type	Employees per Acre	Daily Trips per Employee	Peak Hour Trips per Employee
CBD (Central Business District Commercial)	44	15.7	0.76
NC (Neighborhood Commercial)	44	15.7	0.76
HSC (Highway Service Commercial)	44	15.7	0.76
PC (Planned Commercial)	44	4.2	0.35
LI (Light Industrial)	18	4.2	0.35
PCB (Planned Commercial/Business Park)	18	4.2	0.35
HI (Heavy Industrial)	18	4.2	0.35

Wilbur Smith Associates; May 1992.

Table 6 summarizes the various land use plans and their gross effect on traffic generation in Winters. As can be seen, the 12,500 population plan represents an increase of 185 percent in resident population and nearly 600 percent in jobs within Winters. Overall, these land use

changes are projected to increase total trip-making by approximately 225 percent, from an estimated 25,800 daily trips originating or terminating within Winters to 83,700. Increasing the population to 14,000 is projected to add approximately 9,400 more trips than the trips associated with a 12,500 population level.

External Travel

Another key input to the model is the assumption regarding travel external to Winters. According to the January 1989 *Central Business District Consumer Survey*, approximately 54 percent of Winters employees currently commute to jobs outside the City. For modeling purposes, it was agreed that this percentage would be assumed to remain constant.

Table 6
COMPARISON OF LAND USES AND TRIP GENERATION
Winters Revised General Plan Traffic Analysis

	DU*	%*	Jobs	%*	TP*	%*
Existing Conditions	1,630	–	940	–	25,800	–
Future 12,500 Population	4,740	191%	6,660	608%	83,700	224%
Future 14,000 Population	5,450	234%	6,420	583%	93,100	261%

DU = Dwelling Units; % = Percent Increase; TP = Trips Produced.

Wilbur Smith Associates; April 1992.

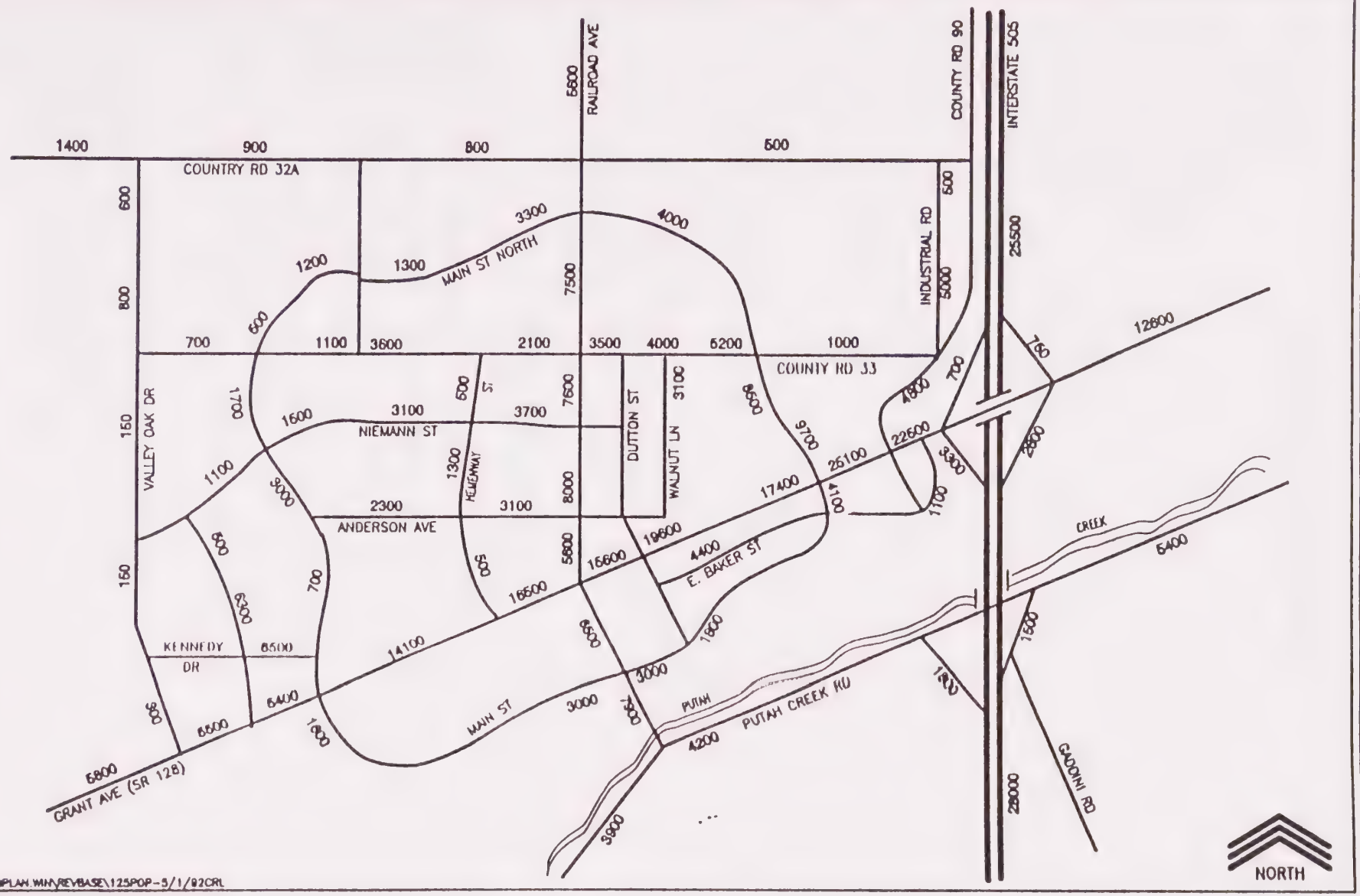
IV - FUTURE TRAFFIC CONDITIONS

Once the changes to the future roadway network, future land uses and external travel assumptions were coded into the MINUTP model, the model was rerun to project future average daily traffic for each of the alternative scenarios. Plotter outputs were also prepared and furnished to the City of Winters as separate products. The first model run tested the existing street network with no improvements, assuming a future population of 12,500 persons. This test revealed that the existing street network would not be able to accommodate this future traffic without experiencing levels-of-services (LOS) D, E, and F at all major Grant Avenue intersections. Figures 6 through 10 depict model-projected traffic on key links for each of the five alternatives listed below, respectively:

- 12,500 Population (Final General Plan);
- 12,500 Population with added Johnson Road bridge (while retaining the Railroad Avenue Bridge);
- 12,500 Population with Johnson Road Bridge only (with the Railroad Avenue Bridge used only for pedestrian Traffic);
- 14,000 Population; and
- 14,000 Population with density shift north of Niemann Street.

For the 12,500 population alternative (Figure 6), Grant Avenue is projected to carry as many as 25,100 vehicles daily east of East Main Street, compared with a current ADT of approximately 7,500. Immediately west and east of Railroad Avenue, Grant Avenue is projected to carry 16,500 and 15,600 vehicles, respectively, compared with 6,900 and 8,000 today. Traffic on the Putah Creek bridge is projected to reach 7,900 (currently 4,700 ADT). Elsewhere on Railroad Avenue, daily volumes are projected to reach 5,500 north of Grant Avenue and 6,500 south of Grant Avenue, compared with existing volumes of 4,200 and 5,900.

Of the proposed new roadways, significant volumes are projected for future conditions with the 12,500 population alternative on the Main Street Loop Road (8,500 - 9,700 daily vehicles between County Road 33 and Grant Avenue), County Road 33 (5,200 west of the Loop Road)



WSA

FORECAST DAILY TRAFFIC 12,500 POPULATION

Winters Circulation Master Plan

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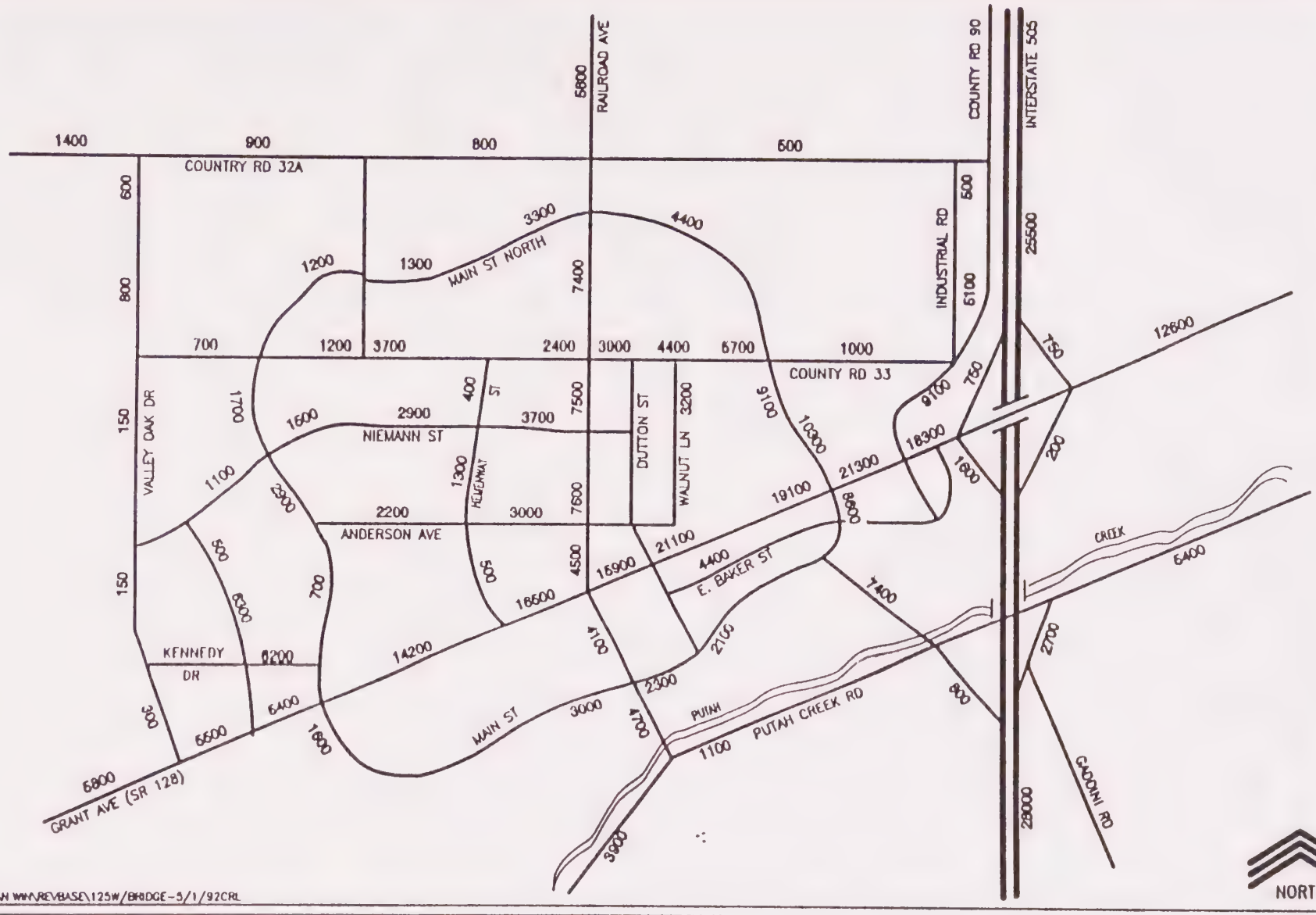
and on the new Industrial Road north of County Road 33. Volumes of 6,500 and 6,300 are also shown for the Kennedy Drive extension east of Taylor Street, and Taylor Street north of Kennedy Drive, respectively; these volumes, however are probably exaggerated by oversimplifications in the model with respect to location of centroid connectors. Proper internal circulation and access design for new developments in this area would probably lead to much of this traffic actually using the Loop Road to reach Grant Avenue.

As shown in Figure 7, addition of a Johnson Road Bridge is projected to shift approximately 3,200 vehicles daily away from the Railroad Avenue Bridge, and approximately 4,000 from the I-505 southbound ramps and Grant Avenue west of the I-505 interchange. Abandonment of the Railroad Avenue Bridge would increase traffic on the Johnson Road Bridge to nearly 12,000, as can be seen from Figure 8.

For comparative purposes, model runs were also undertaken for a land use alternative representing a population of 14,000 persons. Two such model runs were prepared, both utilizing the basic future network (no Johnson Road Bridge). Figure 9 depicts a 14,000 population alternative with the additional 1,500 persons distributed among all areas designated for new residential development, while Figure 10 depicts a 14,000 population scenario with the additional 1,500 increment of population growth assumed to occur north of Niemann Street. As can be seen from Figure 9, the increase in population density is projected to add approximately 2,000 daily vehicles to the eastern portion of the new Loop Road, and to Grant Avenue east of the Loop Road. With the density shift north of Niemann street, a modest increase is seen in Loop Road traffic east of Railroad Avenue and a corresponding slight decrease in Grant Avenue traffic immediately east of Railroad Avenue.



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FORECAST DAILY TRAFFIC
12,500 POPULATION WITH ADDED JOHNSON ROAD BRIDGE
Winters Circulation Master Plan

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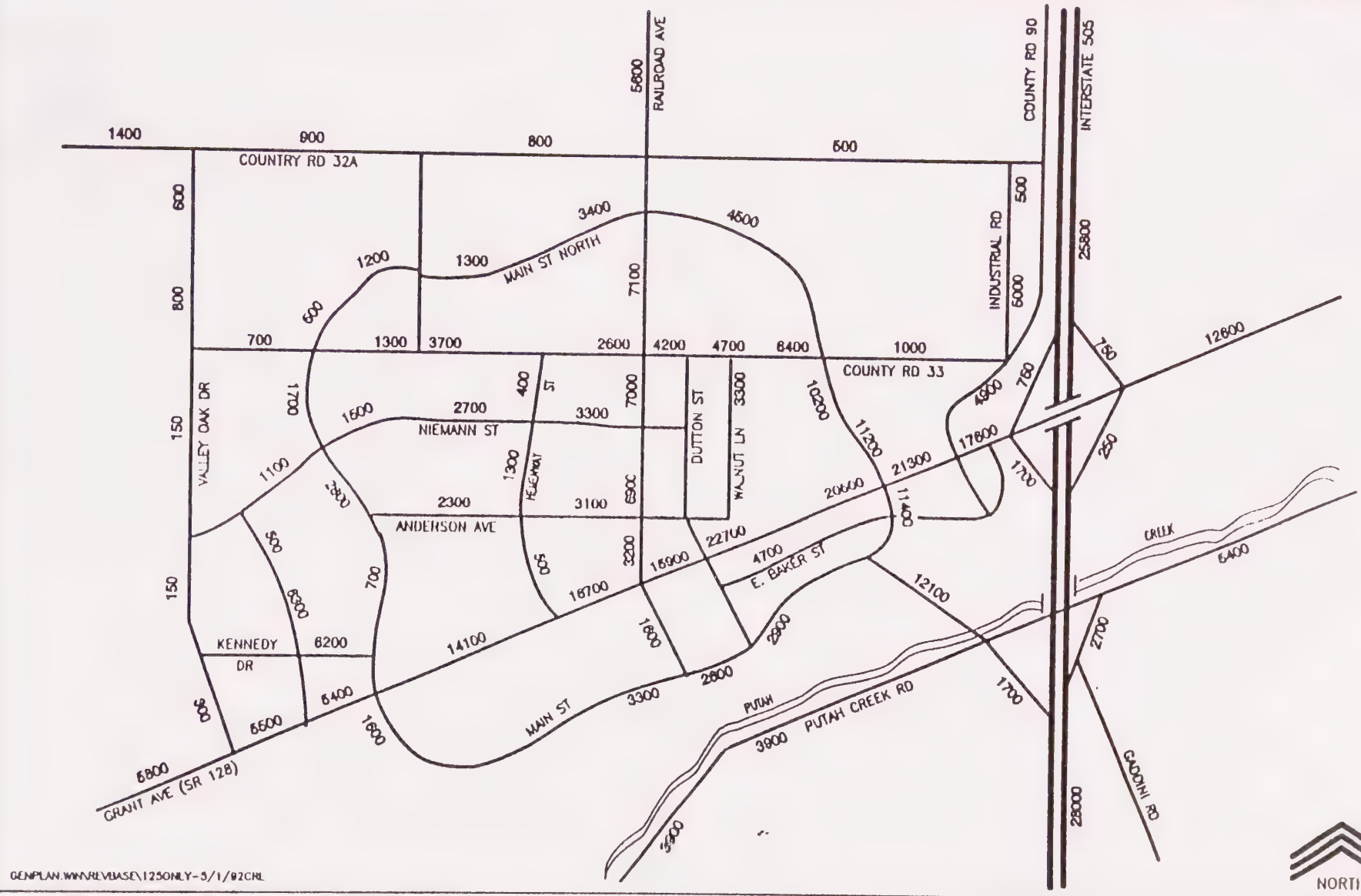

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FORECAST DAILY TRAFFIC
12,500 POPULATION WITH JOHNSON ROAD BRIDGE ONLY

Winters Circulation Master Plan

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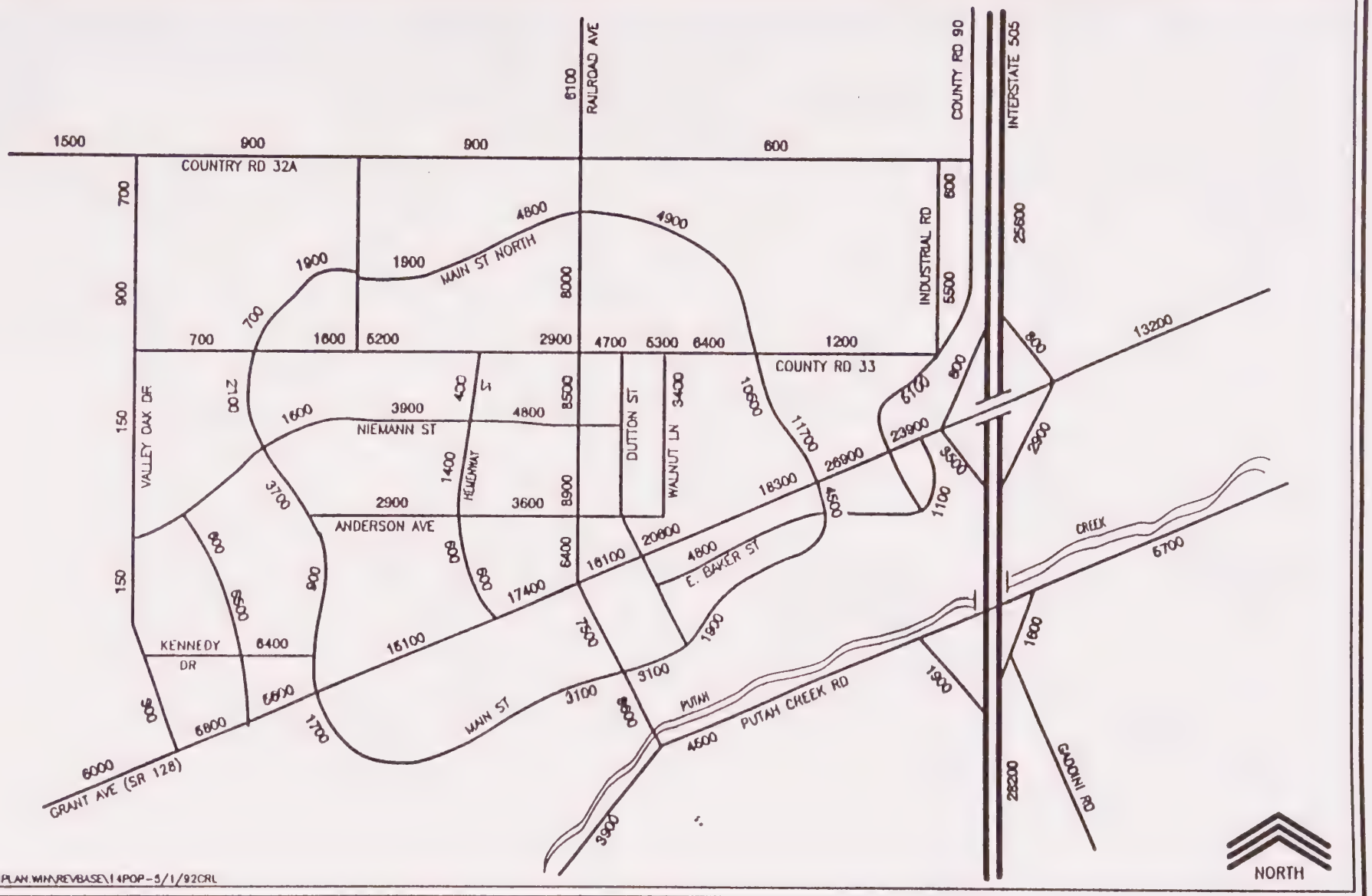

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FORECAST DAILY TRAFFIC 14,000 POPULATION

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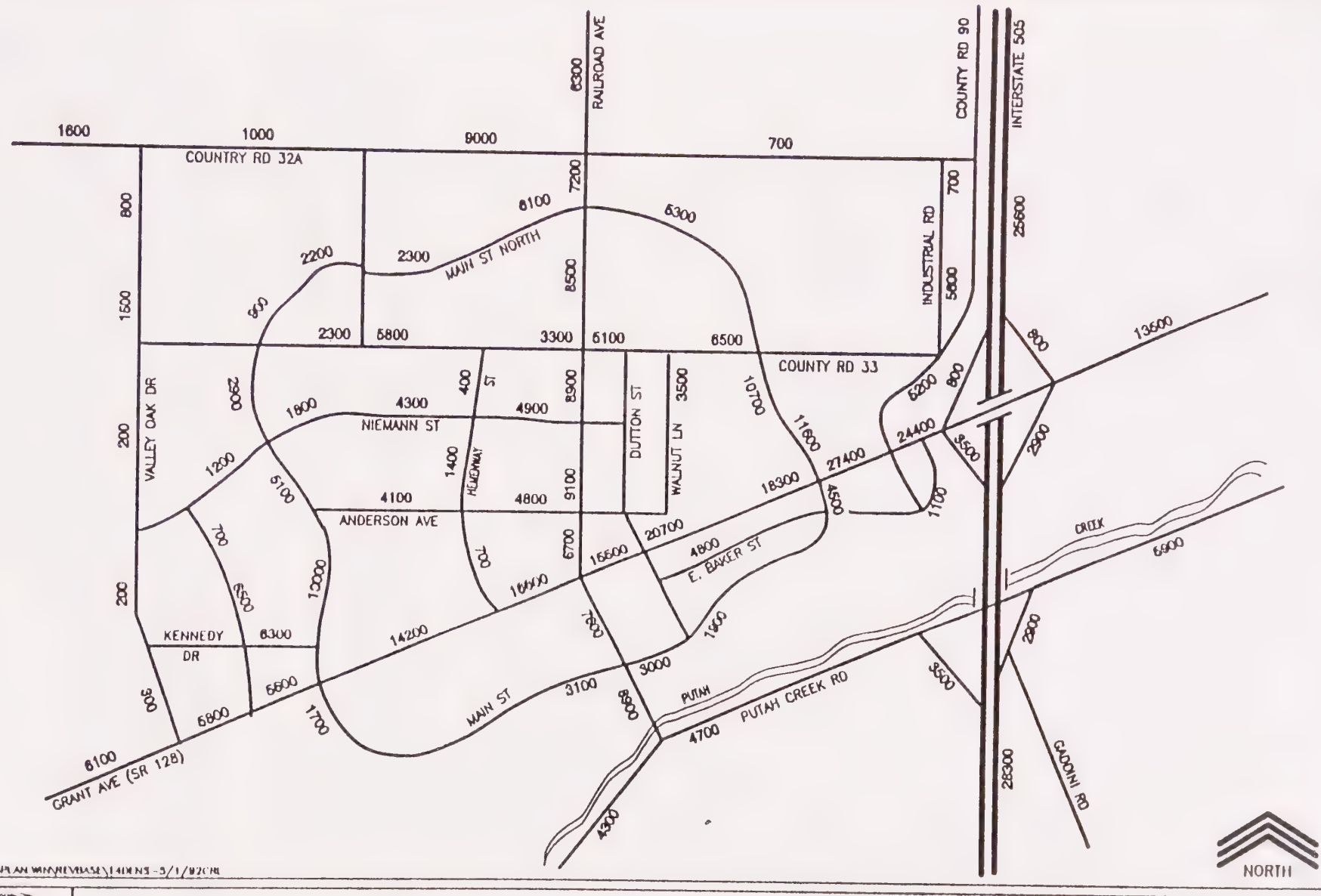

WSA

FORECAST DAILY TRAFFIC 14,000 POPULATION
WITH DENSITY SHIFT NORTH OF NIEMANN STREET
Winters Circulation Master Plan

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V - RECOMMENDED CIRCULATION PLAN AND STANDARDS

In order to evaluate the performance of the network assumed for the Draft General Plan Alternative future scenario model run, an analysis of levels of service was undertaken for roadway segments as well as for key intersections under future development conditions. For roadway segments, MINUTP's capabilities were used to perform volume-to-capacity (V/C) calculations for all links in the roadway system, and produce a summary report of V/C's for the network. It was found that the network assumed for the basic future scenario performed well under future traffic conditions. At the segment level, no links in the system displayed V/C ratios higher than 0.75, indicating that no significant congestion is anticipated with the assumed cross-sections.

At key intersections, future PM peak hour levels of service were estimated using projected future volumes at key intersections along Grant Avenue and Railroad Avenue, including:

- Grant Avenue at Railroad Avenue;
- Grant Avenue at SB I-505 ramps;
- Grant Avenue at NB I-505 ramps;
- Grant Avenue at Main Street (East);
- Grant Avenue at Main Street (West);
- Grant Avenue at new Industrial Road Extension; and
- Railroad Avenue at Main Street.

Each intersection except Railroad Avenue at Main Street was assumed to be signalized. The Railroad/Main intersection was assumed to continue as a 4-way STOP sign controlled intersection. All intersections were evaluated using the *1985 Highway Capacity Manual* (1985 HCM) planning level methods.

Table 7 depicts the results of the Level of Service analysis. All intersections are projected to operate at LOS C or better, with the three Grant Avenue intersections east of the Main Street Loop operating at LOS A. This portion of Grant Avenue was assumed to have been widened to four lanes. It should be noted that the methodology used for evaluating the Railroad/Main

intersection (a four-way STOP sign controlled intersection) only provides a comparison of actual volumes with threshold levels for LOS C and for Capacity conditions; a LOS of B was inferred from the analysis and presented as such for consistency with the other intersections results.

Table 7
FUTURE PM PEAK HOUR LEVELS OF SERVICE
Winters Revised General Plan Traffic Analysis

Intersection	Level-of-Service
Grant Avenue at Railroad Avenue	C
Grant Avenue at SB I-505 Ramps	A
Grant Avenue at NB I-505 Ramps	A
Grant Avenue at East Main Street Loop Road	C
Grant Avenue at West Main Street Loop Road	C
Grant Avenue at Industrial Road Extension	A
Railroad Avenue at Main Street	B

Source: Wilbur Smith Associates; June 1991.

Recommended Circulation Plan

Because the network which has evolved in the course of current planning has been shown to function well under future conditions based on the modeling efforts and subsequent analysis undertaken in this study, it is recommended that this basic network be adopted for the General Plan. Key features of this network are described in Chapter II of this report, and are illustrated in Figure 11, along with the potential locations for traffic signals. Signals would not be needed at all locations. Table 8 lists major improvements to the network which will be required, along with order-of-magnitude costs.

For each improvement an allocation of cost responsibility was estimated assuming these types of improvements.

Table 8

REQUIRED ROADWAY IMPROVEMENTS
Winters Revised General Plan Traffic Analysis

Improvements	Order of Magnitude Cost	Allocation/Source of Cost Reponsibility		
		Existing Problem	New Development	
			Private	Shared
Main Street Extensions (North & South)	$6,075,000	0.0%	85.0%	15.0%
Road 32A Extension (Road 88 to Road 90)	$3,850,000	0.0%	70.0%	30.0%
Road 33 Extension (Road 88 to Road 90)	$3,675,000	0.0%	85.0%	15.0%
Valley Oak Drive Extension	$2,145,000	0.0%	100.0%	0.0%
Repair Putah Creek Bridge	$100,000(1)	100.0%	0.0%	0.0%
Rebuild/Widen Grant Avenue Dry Creek Bridge	$1,700,000	32.5%	0.0%	62.5%
Widen Railroad Avenue North of Grant Avenue	$1,010,000	---	0.0%	100.0%
Rebuild Taylor Street	$ 260,000	100.0%	0.0%	0.0%
Widen East Street	$ 230,000	---	---	100.0%
Widen Grant Avenue	$2,600,000	0.0%	0.0%	100.0%
Widen Grant Avenue/I-505 Overcrossing	$3,000,000	0.0%	0.0%	100.0%
New Traffic Signals (6 at $125,000 each)	$ 750,000	0.0%	0.0%	100.0%

(1) Subject to further structure studies in 1993.

Wilbur Smith Associates; May 1992.

1. Improvements which correct an existing problem.

2. Improvements which provide direct access along the private frontage of new development.

3. Improvements which provide access through existing developed areas, open space or other public lands, but are needed to support new development. This other shared frontage would be funded by development fees.

Recommended roadway classifications and street standards for the General Plan are described below.

Interchange Improvements – As shown in Figure 11, signals are recommended at the intersections of both the northbound and southbound I-505 ramps with Grant Avenue to improve capacity.

Test runs of the model were also undertaken for two alternative interchange configurations. The first would include moving the terminus of the southbound off-ramp from its present Grant Avenue location to County Road 33, with a new connector roadway extending from County Road 33 at the southbound off-ramp to Grant Avenue at the existing southbound on-ramp. The second alternative modeled consisted of removing the existing southbound on-ramp and replacing it with a new southbound on-ramp extending from the intersection of the Baker Street Extension with the new industrial road extension to the I-505 mainline in the vicinity of Putah Creek.

The first of these two alternatives, relocation of the southbound off-ramp, was shown to have little impact on traffic circulation, largely because of the relatively small number of trips between Winters and points north on I-505. The second alternative, envisioned as a possible alternative to a Johnson Road Bridge, was shown to lessen traffic on Grant Avenue by approximately 2,000 daily trips between Baker Street and I-505; overall, it would have less impact than a Johnson Road Bridge, since a Johnson Road Bridge was shown to attract a substantial number of non-freeway trips.

Both of the alternative interchange concepts could be expected to encounter objections from Caltrans, since they would not provide direct access to the roadway they are primarily intended to serve, i.e. Grant Avenue, and are not recommended.

Recommended Roadway Classifications

A roadway classification plan was developed for the future circulation network based on the function of roadways within the network as well as traffic volumes projected by the model. Figure 11 depicts the proposed classification for Winters. The various categories are described below.

Definitions – The most commonly used source of roadway classification guidelines is *A Policy on Geometric Design of Highways and Streets, 1990* by the American Association of State Highway and Transportation Officials (AASHTO). This source provides basic descriptions of the nature of Arterial streets, Collector streets and Local streets. However, while the AASHTO definitions stratify Arterial streets into Principal Arterials and Minor Arterials and specify a single class of Collector streets, it has been common practice in California communities to use a single category of Arterial streets and to subdivide Collector streets into primary and secondary or principal and minor. This distinction is especially useful for small urban areas such as Winters, where only a very small number of facilities are recognizable as arterials. Accordingly, this approach has been adopted for this study, with the following categories recommended for Winters:

- Arterial Streets;
- Primary Collector Streets;
- Secondary Collector Streets; and
- Local Streets.

Freeways, although indicated as a category in Figure 11, are not considered part of the street system for classification purposes. The local street system in Winters includes all those streets not depicted in Figure 11.

Definitions of the street classifications are provided below, based on language offered by the AASHTO publication, with appropriate modifications.

- **Arterial Streets** – Arterial Streets are defined as streets which serve major centers of activity, the highest traffic volume corridors, and the longest trip desires; are integrated internally, and provide service between major rural connections.

- **Primary Collector Streets** – Primary Collector Streets are those which interconnect with and augment the Arterial street system, accommodate trips of moderate length at a lower level of service than arterials, and provide intracommunity continuity.

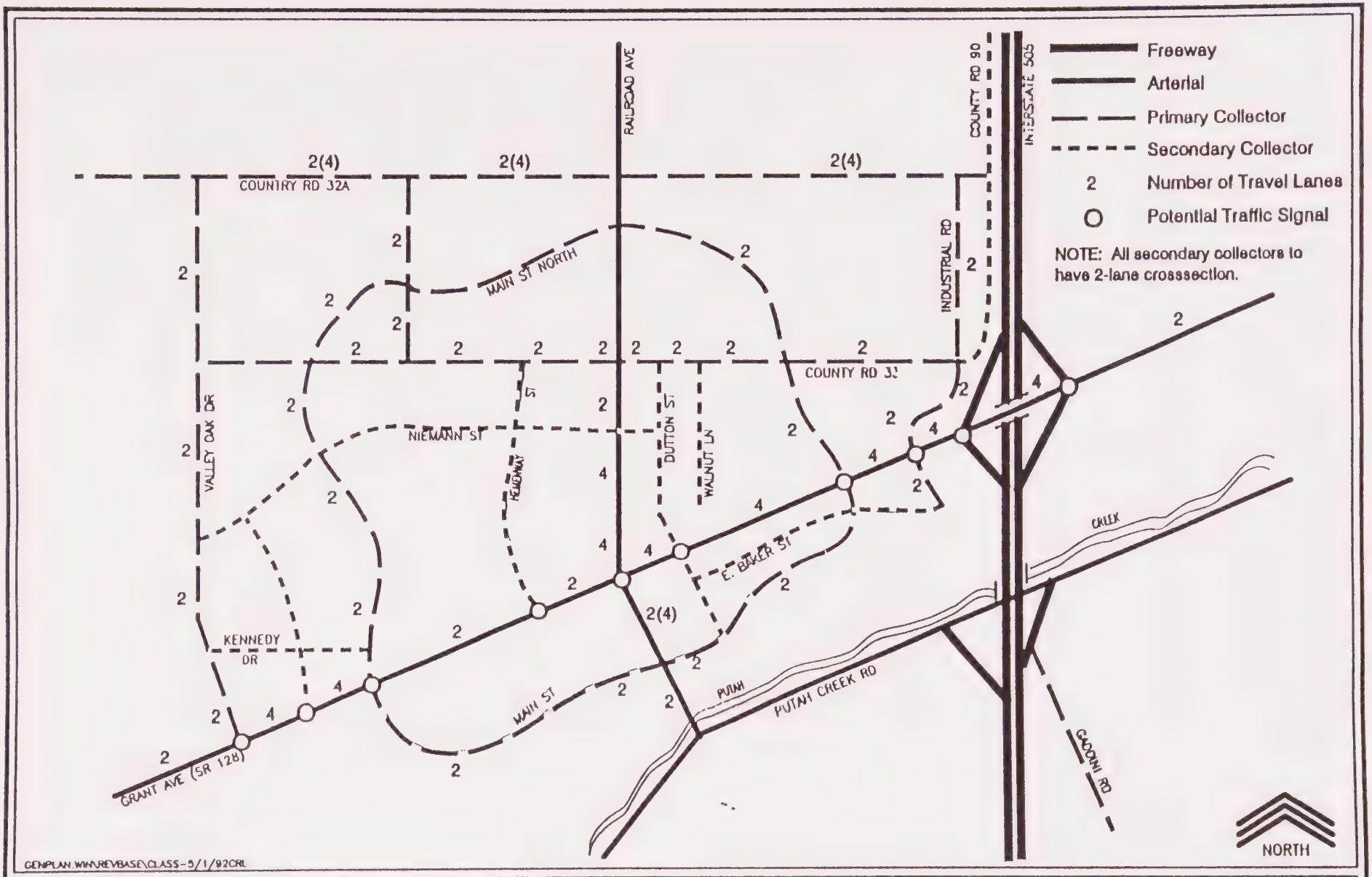
- **Secondary Collector Streets** – Secondary Collector Streets are those which provide both land access and traffic circulation within residential and commercial areas, and distribute traffic between residential neighborhoods and Primary Collectors and Arterials at a lower traffic level of service than Primary Collector Streets.

- **Local Streets** – Local Streets include all those not included in higher classifications, and typically provide the highest direct access to abutting land uses and the lowest mobility levels of the system, discouraging through travel.

As seen in Figure 11, Grant Avenue and Railroad Avenue are classified as Arterial streets. Putah Creek Road, though falling outside Winters, also provides an Arterial street function and is included in the figure for system completeness. The Main Street Loop Road, Valley Oak Drive, County Road 32A, County Road 33, and the proposed Road 32A/Road 33 connector midway between Valley Oak Drive and Railroad Avenue are classified as Primary Collectors, as is the new Industrial Road west of I-505 and its connections to East Baker Street and the I-505 southbound on-ramp. Other roads depicted in Figure 11 are seen as fulfilling the function of Secondary Collector streets.

Recommended Street Standards

Recommended cross sections for the various street classifications are depicted in Figure 12. These standards were based on a review of standards published by Caltrans, AASHTO, and



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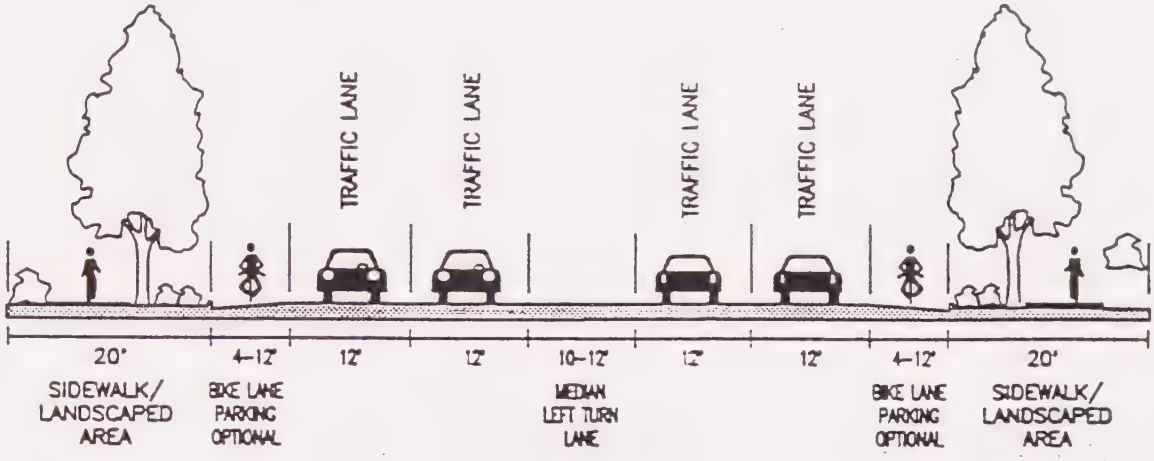
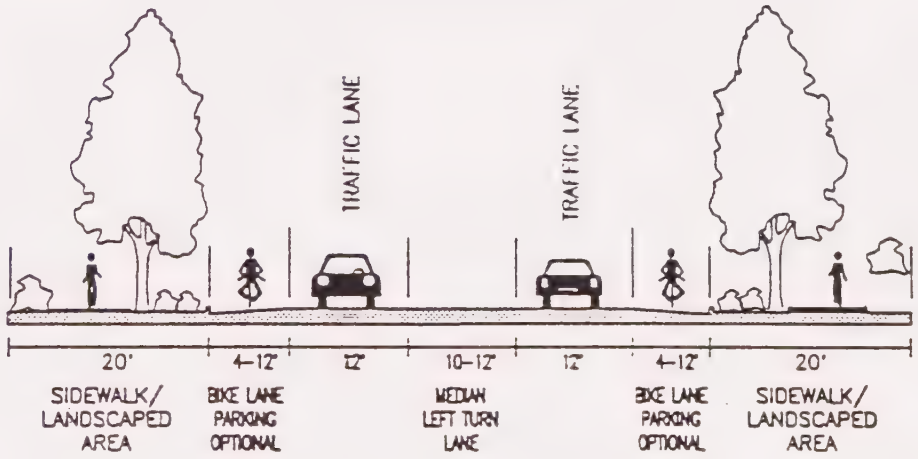
RECOMMENDED ROADWAY CLASSIFICATIONS AND LANE REQUIREMENTS

Winters Circulation Master Plan

11



4-LANE ARTERIAL
PAVEMENT: 66-84'
RIGHT-OF-WAY: 106-124'



2-LANE ARTERIAL
PAVEMENT: 54-72'
RIGHT-OF-WAY: 94-112'

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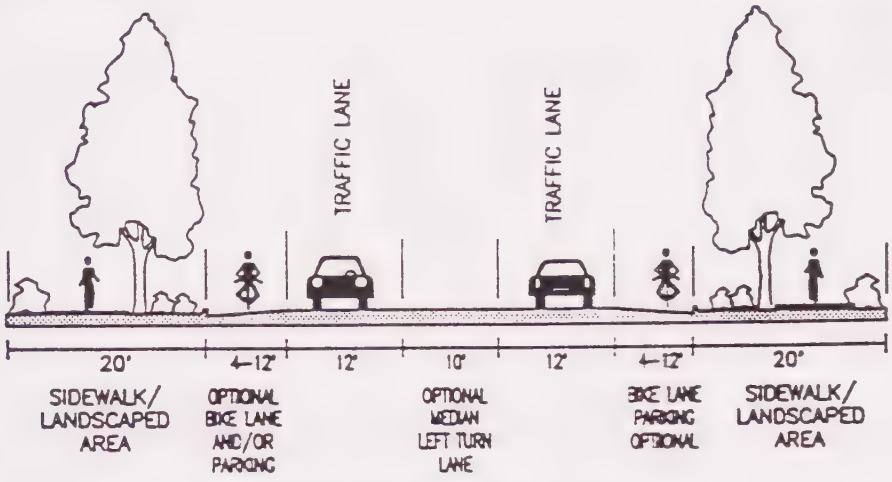
WSA

RECOMMENDED STREET STANDARDS

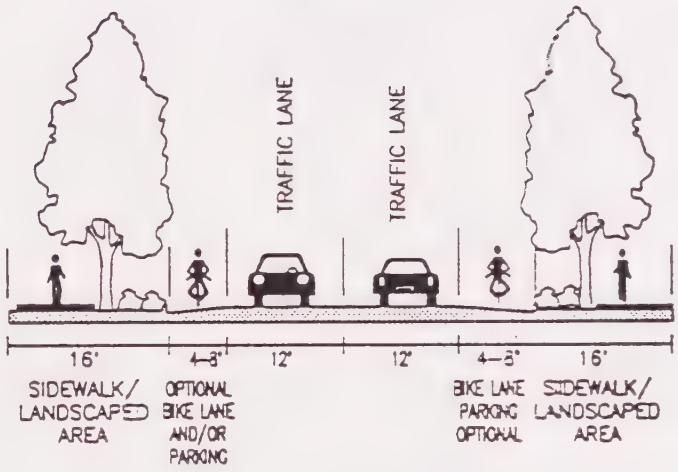
Winters Circulation Master Plan

12



2-LANE PRIMARY COLLECTOR

PAVEMENT: 32-58'
RIGHT-OF-WAY: 74-98'



2-LANE SECONDARY COLLECTOR

PAVEMENT: 24-40'
RIGHT-OF-WAY: 56-72'

LOCAL STREET

PAVEMENT: 24-38'
RIGHT-OF-WAY: 32-50'

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the Institute of Transportation Engineers, as well as local practice. These standards are presented as optimum standards, subject to over-riding right-of-way and cost constraints.

- **Arterial Streets** – Arterial streets provide for two or four 12-foot travel lanes, a 10-foot to 12-foot median, 4-foot to 12-foot shoulders for bike lanes and possibly parking, and 20-foot sidewalk/landscaped areas.

- **Primary Collector Streets** – Primary Collector streets provide for two 12-foot travel lanes, an optional 10-foot median/left-turn lane, 4-foot to 12-foot shoulders for bike lanes and parking, and 20-foot sidewalk/landscaped areas.

- **Secondary Collector Streets** – Secondary Collector streets provide for two 12-foot travel lanes, 4-foot to 8-foot shoulders for bike lanes or parking, and 16-foot sidewalk/landscaped areas.

- **Local Streets** – Local streets provide for two travel lanes plus optional parking within a 24-foot to 38-foot pavement width and 4-foot to 6-foot sidewalk/landscaped areas.

Lane Requirements

As noted above, four-lane cross sections are desirable for Arterial Streets. Within Winters, this includes Railroad Avenue and Grant Avenue. Due to right-of-way constraints, however, widening of Grant Avenue between Cemetery Drive and Railroad Avenue, would not be practical. Regarding Railroad Avenue, analyses indicated that maintaining a two-lane cross section in the vicinity of Grant Avenue would result in unsatisfactory LOS D operations under future conditions, and near-capacity operations at the Main Street intersection. County Road 32A was classified as a two-lane primary collector, but may need to be expanded to four lanes if development occurs north of this road.

Based on future traffic projected by the model, Primary Collector streets are not projected to require more than two-lane cross-sections based on traffic capacity considerations.

Recommended Volume Standards

Table 9 presents the recommended range of daily traffic volumes for each type of roadway, based on acceptable traffic-carrying capacity ranges. All projected Year 2010 volumes were found to fall within these ranges, except a portion of the two-lane section of Grant Avenue west of Railroad Avenue, which was projected to exceed 15,000 vehicles daily under the 14,000 population scenarios. This segment is right-of-way constrained; however, it is likely that local intersection improvements will be capable of maintaining acceptable traffic flow in this section.

Table 9
RECOMMENDED TRAFFIC VOLUME STANDARDS

Roadway Type	Daily Volume Range
Four-Lane Divided Arterial	25,000 - 30,000
Four-Lane Undivided Arterial	17,500 - 22,500
Two-Lane Divided Primary Collector	10,000 - 15,000
Two-Lane Undivided Primary Collector	8,800 - 11,000

Wilbur Smith Associates; August 1991.